Journal of the Society of Arts.

FRIDAY, JANUARY 11, 1867.

Announcements by the Council.

NOTICE TO MEMBERS.

The Council have decided to set apart the first Wednesday in each month, during the present Session, for the discussion of various questions connected with Arts, Manufactures, and Commerce; these discussions may commence either with or without the reading of a paper.

Any member desiring to introduce a subject for discussion should give notice of it to the Secretary, and, if approved by the Council, it will be announced in the *Journal* for one of these evenings. The member who opens the discussion must not occupy more than half-an-hour, but will have the right of reply. No division is to be taken.

On the evening of Wednesday, the 6th February, Mr. Henry Cole, C.B., will introduce the following subject:—

"On the existing legal regulations in reference to the Cab Fares in the Metropolis, and their effect in rendering the Vehicles inferior to those provided in other European Capitals and the large Municipal Towns of this Country."

A new list of members of the Society has been printed, and any member can have a copy sent to him on application to the Secretary.

The Council have appointed Mr. Astrup Cariss, of Liverpool, Honorary Local Secretary to the Society of Arts in that district, in the room of the Rev. Dr. Hume, resigned.

ORDINARY MEETINGS.

Wednesday Evenings at Eight o'clock:—

JANUARY 16.—"On Mercantile Marine Legislation, as affecting the Number and Efficiency of British Seamen." By Captain TOYNBEE, F.R.A.S.

JANUARY 23.—"On the Iron Permanent Way used on German Railways." By T. A. ROCHUSSEN, Esq.

JANUARY 30.—"On Artificial Illumination." By D. N. DEFRIES, Esq.

CANTOR LECTURES.

The following is the syllabus of the course of Six Lectures "On Pottery and Porcelain," illustrated by specimens of various manufactures, and by photographs and diagrams, to be delivered by William Chaffers, Esq.:—

LECTURE I.—MONDAY, JANUARY 21.

ANCIENT POTTERY.—Introduction. Assyria and Chaldea, Egypt, Greece, Etruria, Rome, &c.

LECTURE II.—MONDAY, JANUARY 28.

MAIOLICA.—Italy, Spain, Persia, &c.

LECTURE III.—MONDAY, FEBRUARY 4.

FAYENCE.—France, Spain, Portugal, Russia, Sweden, Denmark, &c.

GRÈS OR STONE WARE of Germany and Flanders. DELFT WARE, &c.

LECTURE IV.—MONDAY, FEBRUARY 11.

ORIENTAL PORCELAIN.—China, Japan.

LECTURE V.—MONDAY, FEBRUARY 18.

EUROPEAN PORCELAIN.—Italy, Germany, France, Holland, Belgium, Russia, Poland, &c.

LECTURE VI.—MONDAY, FEBRUARY 25.

ENGLISH POTTERY AND PORCELAIN.—Early History, continued to the beginning of the 19th century.

The lectures will commence each evening at eight o'clock, and are open to members, each of whom has the privilege of introducing one friend to each lecture.

SUBSCRIPTIONS.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FOOD COMMITTEE.

The sub-committee met on Friday, the 4th inst., and again on Wednesday, the 9th inst.

The following correspondence has taken place on the subject of Mr. Chester's observations on the various kinds of *Extractum carnis* in his opening address, published last week:—

Plough-court, Lombard-street, E.C., Jan. 4, 1867.

SIR,—In your important address to the Committee of the Society of Arts for inquiring and reporting respecting the food of the people, we notice an allusion to Liebig's extract of meat, which, we fear, is liable to lead to an erroneous inference respecting the position of manufacturers of the article, and the relative merit of their products. You are reported to have said that you "believed there was not much doubt as to which of the three (advertised) was the genuine article." It is the fact that a joint stock company was formed about a year ago to manufacture the extract in South America, and that they are now strenuously endeavouring to create a monopoly in the trade; and we regret to add that in this they are supported by Baron Liebig, who has become pecuniarily interested in the undertaking. But it is also the fact that Baron Liebig published the process for making the extract, upon his discovery of it, in the "Annalen der Chemie und Pharmacie" for 1847. Also in "Liebig and Kopp's Report for 1847-8;" in his "Chemistry of Food," 1847; in his "Familiar Letters on Chemistry," and probably elsewhere. It was also published, many years since, in the Bavarian Pharmacopœia; in Cooley's "Encyclopedia of Receipts;" in Beasley's "Pocket Formulary," &c. Hence there really appears to be no ground for the product of one manufacturer being called genuine in preference to that of another, though doubtless quality will vary, according to the skill and good faith with which the process is carried

out. As the commercial representatives of a gentleman who, by great energy and the expenditure of a large amount of money, has been the first to manufacture Liebig's extract of meat as an article of commerce in Australia, we feel it due to him and to all others interested in this important article to trouble you with these explanations. Trusting that this may be a sufficient apology,—We remain, &c., ALLEN and HANBURYS.

To Harry Chester, Esq., Rutland-gate.

63, Rutland-gate, S.W., 5th January, 1867.

GENTLEMEN,—I have the honour to acknowledge the receipt of your letter of the 4th inst. It is possible that the expressions which I used may lead to an erroneous inference respecting the position of manufacturers of the *Extractum carnis*, but scarcely, I think, respecting the relative merit of their products. I intended to imply that, while only one of the three was an article guaranteed by Professor Liebig himself, the Committee, in the interest of the public, would do well to subject all three to the same analysis, and to give publicity to the result, in order that it might be known which was really the best. Nothing could be further from my wishes, in connection with the important subject of the food of the people, than to promote a monopoly of any kind.—I have, &c., HARRY CHESTER.

To Messrs. Allen and Hanburys, Plough-court.

The Monte Videan Consul-General has made an application for a few numbers of the Society's *Journal* to be placed at his disposal for transmission to South America each mail during the discussion on the food question, "in which," he says, "the Republic of Uruguay is so greatly interested." He adds that "it is intended to offer a liberal prize, during the Paris Exhibition, for a process the best adapted for the utilisation of La Plata beef for European markets." This request has received a favourable reply.

THE BRITISH COLONIES AT THE PARIS EXHIBITION.

BY P. L. SIMMONDS.

It is satisfactory to know that the Colonial Possessions of the British Empire are likely to be well represented at the approaching great International Exhibition in Paris. The French are determined to make the most of the products and manufactures of their colonies, and the plan of the arrangements to be carried out at Paris under the two chiefs in this special department is excellent. M. Aubry-Lecomte, the intelligent curator of the Colonial Department, made an excellent display even in his limited space in the French Court in London, in 1862. Where the valuable collection of colonial products, so admirably labelled and described, which were handed over to South Kensington by the French Government, now is I cannot say. I believe, however, it has been sent to the branch Museum at Edinburgh. Seldom has such an opportunity of supplementing the food and trade collections of South Kensington been afforded as that furnished by this vast collection. As a well-informed traveller, personally acquainted with the colonies—a good botanist, and a man eminent for his scientific writings—the acquisition of a large collection which had passed through M. Aubry-Lecomte's hands was an event of importance. The valuable jury and other official reports on the Exhibition of 1862 which he prepared for his Government, and the distinctions he has received, are proofs of his extended knowledge and ability. The Algerian collection of M. Teston, though to some extent more restricted in its character, was also most characteristic and interesting. The two special French permanent colonial collections of Algeria and the Colonies having been temporarily removed from the Palais de l'Industrie, in order that that building may be utilised for the great *fêtes* of the forthcoming Exhibition, the curators have the more leisure to develop the indigenous products and manufactures of the colonies with which they are charged. While, therefore, the French on their own more extended ground are desirous of making a magnificent display of the resources of their few colonies, it is pleasing to find that full opportunity is at the same time given to the British colonies to stand prominently forth before the European world and visitors at large.

It is generally admitted that one of the finest displays ever made by our Colonies was that in 1862; and as an equal amount of space is afforded them collectively at Paris, there is every reason to believe that they all intend to do their best.

According to the official allotments, the following are the proportions of space assigned for each group:—

NORTH AMERICAN COLONIES.	Feet.
Canada	2,000
Nova Scotia	600
New Brunswick	600
Prince Edward Island	250
Newfoundland	200
Bermuda	100
Vancouver Island	200
British Columbia	100
	4,050

WEST INDIAN.	Feet.
Jamaica	450
British Guiana	350
Trinidad	150
British Honduras	100
Bahamas	150
Dominica	50
St. Vincent	50
Barbados	10
	1,310

AUSTRALIAN.	Feet.
Victoria	1,500
New South Wales	1,000
South Australia	650
Tasmania	650
Queensland	450
New Zealand	300
	4,550

EAST INDIAN, ETC.	Feet.
Ceylon	300
Mauritius	150
Malta	150
AFRICAN.	
Natal	200
Cape Colony	100
St. Helena	50
	950

We are likely to have twice as many colonies represented at Paris in 1867 as in 1855. From the foregoing figures, it will be seen that Canada and Victoria will fill the largest spaces. Having had much previous experience in colonial arrangements, and being also in the receipt of official advices from most of the governors, I am enabled to make some few remarks as to the probable displays of each group of colonies; and certainly in the aggregate they will have lost none of their importance and attractiveness since 1862.

Firstly, then, as to the North American group. Canada has always made a fine display at the International Exhibitions, and with a large portion of her

population of French extraction, there is naturally a desire to place her products and manufactures prominently forward in France. In 1855 Canada received one grand medal of honour, one medal of honour, 13 first-class and 30 second-class medals, besides 43 honourable mentions. The display of the products of mines, forests, and agriculture on that occasion was truly magnificent. Upwards of £16,000 was spent on it. In London in 1862, although a very fine display was made, the commission were stinted for funds.

Nova Scotia, which has taken a prominent and creditable part in the two last International Exhibitions, will put in a good appearance at Paris, under the able superintendence of Dr. Honeyman, F.G.S., who has done so much for her geology and credit in former Exhibitions. Of New Brunswick and Prince Edward Island we hear little at present, although they both sent good collections to London in 1862. Newfoundland will doubtless do something, now that the colony is brought so prominently into notice by the Atlantic Cable. It has little, however, to show except the products of its abundant fisheries, some few minerals, and furs. Bermuda may make a small and neat display. The great distance of our north western possessions on the Pacific, is likely to prevent exhibits from Vancouver and British Columbia reaching Paris in time. Of the West Indian group, British Guiana, Trinidad, and the Bahamas, are the only colonies from which collections may be expected. The recent political excitement in Jamaica has quite interrupted attention to science. Honduras and the smaller West Indian islands may send a few things, as in 1862.

With the exception of Western Australia, the whole of the Australasian colonies will be well represented. Their financial condition and industrial resources enable them to stand forth prominently on this occasion. The only fear is that Victoria will, as in 1862, be behindhand at the opening day, and whilst not being ready herself, will also have been the means of keeping back many of the other colonies whose goods should be near at hand, to be ready for installation in February or March. With the disposition to centralize and attract notice to herself, Victoria has just been holding an Intercolonial Exhibition, to which most of the adjoining colonies were induced to send their exhibits in the first instance before transmitting them to Paris. This local exhibition was only opened in Melbourne on the 24th October, and it is not likely that the goods can be repacked and shipped from Port Phillip before the end of December, so that unless quick passages are made, the vessels cannot arrive in London before the end of March, affording no time whatever for unpacking and arranging goods for the opening on the 1st April. Some of the products intended to be shown by Victoria were noticed recently in the *Journal*.

South Australia proposes to send to Paris a fine collection of its splendid wheat and flour, soap, raisins, pickles, and preserves; kangaroo, calf, and other tanned skins, a large quantity of wine, in bottles and casks; about 100 fleeces of wool, a fine collection of minerals in blocks, cases and cabinet specimens, a slab of marble, 5 feet by 3, a case with 80 facsimiles of Australian fruits, a fine collection of natural history specimens, comprising 200 birds, 12 animals, several fish, reptiles, &c., a collection of woods, photographs, bundles of native spears, implements, waddys, &c., and 18 or 20 live animals and birds. The commissioners appointed are the Hon. G. M. Waterhouse, the Hon. H. Ayers, and Mr. Anthony Foster.

Those who remember the fine and varied collections shown by Tasmania, New South Wales, and Queensland in 1862, will feel assured that in wool, woods, fibres, and minerals they will be equally well represented; also in manufactures and industries, which have lately risen to some importance.

The Colonial Secretary of New Zealand advises me officially that by an arrangement made some time since, the several Superintendents of the nine provinces of the colony were appointed Commissioners, for the purpose of securing the proper representation of the products, &c., of each particular province at the Paris Exhibition. Bearing in mind the excellent display of products made last year at the Otago Exhibition, Dunedin, a very creditable and interesting general collection may be expected from New Zealand.

Of the East Indian and African groups of colonies I have no special advices. Dr. Forbes Watson, I know, is actively engaged in making a noble display of the various products and industries of India; and not the least interesting feature will be the great work which he has recently brought out, on the "Textile Manufactures and Costumes of the People of India." It is to be hoped that the approaching transfer of the India Museum to South Kensington will not lead to the entire withdrawal from public view of the raw materials and trade products, which are there considered subordinate to the more attractive mediæval and fine art objects.

Mauritius always holds its ground in its special products, under the able management of its Commissioner, Mr. J. Morris; and its native manufactures are sure to be well represented in Paris.

Natal will send a fine collection, as she did to London and Dublin; but the Cape Colony has little to exhibit beyond its wool and wines.

POPULAR EDUCATION IN GERMANY AND SWITZERLAND.

In a letter to the *Manchester Examiner and Times*, Mr. Joseph Kay, who is so well known as an authority on the above subject, says:—

You permitted me to tell your readers how the towns of Prussia, Hanover, Saxony, Baden, Wurtemburg, Bavaria, and the cantons of Switzerland provide themselves with school buildings, playgrounds, teachers, books and apparatus, and how they raise the funds wherewith to pay the school fees for the children of poor parents, and wherewith to supply them with decent clothing for school attendance.

Will you allow me to explain, as simply as I can, the great efforts which these countries are making to obtain good, learned, and efficient teachers for the management of the schools in which the children of nearly all classes of the people commence their education. Of course, in this, as in other parts of their educational systems, the regulations of these different countries vary in some particulars, and in a letter like this I can only attempt to give a general survey of them.

When these countries first began, after 1819, to put in actual effective operation systems of compulsory education, it was felt that it would be worse than useless to provide school buildings and playgrounds, or to send the children there, unless by some means or other good and efficient teachers were obtained for the superintendence, management, and instruction of the children. Several eminent men, and among others, Pestalozzi, Dr. Fallenberg, Vehrli, and Dr. Diesterweg, insisted that a teacher's duties required for their right performance a special training; that an inefficient, ignorant, and immoral man, in such a situation, was a positive evil; that if the teachers really understood the duties of their profession and earnestly performed them, the social condition of the poor would be soon vastly improved; and that it was the duty of the nation, for the sake of its own highest interests, to find all the funds which were necessary for the training of the teachers, for their proper maintenance when appointed, and for their due support when disabled. They argued that by these means fit men would be induced to seek to enter into the profession, and to devote themselves to its important but arduous duties. Several of the eminent men to whom I have alluded established institutions themselves, where for many years they devoted themselves to the education of teachers, in order to show their countrymen what the

teachers of their children ought to be. Of these original institutions I visited two—one conducted on the lake of Constance, by Vehrli; and the other conducted near Berne, by the son of its founder, the celebrated Dr. Fellenbergh.

The example and teaching of these men gradually produced its effect. Training colleges for the teachers were established, first in the Swiss Cantons, then in Prussia, and, at last, over all the countries I have named. And now, for the last forty years in some of these countries, and for the last thirty in others, great sums have been annually expended by the governments in founding, perfecting, and supporting great numbers of these colleges for the education and training of the teachers of the different religious parties. Some of these colleges are set apart for the education of Roman Catholic teachers, and others for the education of the teachers of the Protestant churches.

As soon as means were provided for the education of teachers laws were enacted which prohibited any person from officiating as a teacher, either in a private or a public school, until he had passed an examination and obtained a diploma or certificate of fitness from one of the examining bodies instituted by law. All the teachers in these countries are now educated men who have obtained their diplomas.

Schools like our so-called "dame schools," and schools conducted by poorly-educated mechanics, shoemakers, or tailors, are unknown in these countries. They would not be tolerated. In some of the countries I have mentioned it is thought so important that none but really efficient men should be entrusted with the management of schools that the law forbids the examiners to grant a diploma or certificate to any one who is deaf, blind, lame, deformed, or consumptive. And, in addition to these precautions, the examiners are forbidden to grant a diploma to any candidate who does not present at the examination a certificate of good moral character, signed by the religious minister of the congregation to which the candidate belongs.

Such being the stringent precautions which are taken to shut out unfit persons from the profession, let us see what has been done to induce clever boys and young men to strive to enter it. The inducements are the following:—

1. Nearly all the expenses of the teacher's education are paid by the central or provincial governments.
2. If the young candidates once succeed in getting a diploma, their future career is assured.
3. A house, a moderate and increasing stipend, fuel, and, in the country districts, a small plot of land, of one or two acres in extent, are provided for the teacher.
4. A provision is made for those who become incapacitated by age or sickness.
5. A provision is also made for the widows of deceased teachers.
6. They are exempted from liability to perform military service.

But what is beyond all these advantages, in the estimation of many, is the fact that the profession opens an honourable career to the intelligent and clever children of the poorest parents. It is an outlet for the intellectual activity of the ablest of the poorest classes. It is a ladder by which a clever boy may climb out of the ranks of mere manual labour.

This last consideration, and the universal sense of the good that these excellent men are doing, side by side with the religious minister, make them thoroughly popular and thoroughly trusted among all classes of the people. The teachers are always mentioned with respect and admiration. Owing to these considerations, there are always in all these countries great numbers of candidates for the teacher's profession. These candidates are the sons of mechanics, small shop-keepers, workmen, farmers, and of the teachers themselves.

Let me shortly sketch the training and education through which those who wish to enter the teacher's profession have to pass.

All children, if not educated at home, are obliged to attend some school until their 15th year. If, at that time, a boy's parents wish him to enter the teacher's profession, and if he shows sufficient ability and industry to give fair promise of success, he remains at the primary school for two or three years longer, and pays the teacher some small extra fee for special instruction; or, if his parents or friends can afford the small extra expense, he enters the classes of one of the superior or secondary schools. Until he attains the age of 18, he pursues his studies in one of these schools. At the age of 18 he takes with him certificates of conduct, and presents himself at one of the annual entrance examinations of one of the teachers' colleges. All the candidates are then examined. The most proficient are selected to supply the annual vacancies. Once admitted into one of these institutions, the expense of his education and board is defrayed for two or three years almost entirely, and in some cases entirely, by the government.

There are several hundreds of these colleges established throughout the provinces of these countries. Many of them are large, roomy, and admirably arranged buildings, surrounded sometimes by a farm and sometimes by large gardens. The education given in these institutions is of the most liberal, but at the same time of the most practical kind. The education comprises:—

1. Religious instruction under the direction of the head of the college.
2. The German language.
3. Geography, history, the rudiments of the physical sciences, botany, and natural history.
4. Farming or gardening.
5. Drawing.
6. Music.
7. Pedagogy, or the art of teaching.

In some of these colleges Latin is also taught. In all of them the young teachers practise singing and also the use of some musical instrument. Nearly all the teachers in Prussia can play either on the organ, pianoforte, or violin. In one of the Prussian colleges I saw four organs, nine pianofortes, and 100 violins, for the use of the students. Singing forms a part of the instruction given in all schools, both in the towns and in the country districts.

In many of these colleges, the young men are taught how to dress the more ordinary kind of wounds, and how to act in the case of the more ordinary kind of accidents, so that they may be able to render aid in the villages, in the absence of a medical man.

In some of the purely agricultural provinces, the young teachers are taught scientific and practical farming, so as to be of use to the farmers in the remote districts in which they will have to labour. In many of the colleges, they are taught how to manage orchards and kitchen gardens, and how to prune trees.

A school for the children of the neighbourhood is generally connected with each of these institutions. In the school the young teachers practise teaching for a certain number of hours every week, under the guidance and surveillance of experienced teachers. I mention all these things only to give your readers some faint idea of the care which is bestowed in these countries to fit the teachers to be the instructors and the moral guardians of the children, the assistants and friends of the parents, useful neighbours of all, and disseminators of a higher civilisation in the remoter districts.

I visited these colleges in the provinces on the Rhine, at Berlin, in the south of Prussia, in Saxony, at Carlsruhe, in Bavaria, on the Lake of Constance, and in many of the Swiss Cantons. Everywhere the effort seemed to be to make the teachers as efficient and as useful as possible to the people among whom they would have to labour and to live.

When the period of residence in these colleges is con-

cluded, the young men are examined by boards of examiners. If they pass these examinations satisfactorily they receive their diplomas, and they can then accept a situation as teacher. But if they do not pass they cannot obtain a diploma, and the law forbids, in their case, their acting as teacher, until they have obtained the necessary certificate of competence at another examination.

Every parent has, by these means, the assurance that any one who is officiating as a teacher has obtained a diploma, certifying the sufficiency of his acquirements and the correctness of his moral conduct; while the reputation and status of the teacher is, by these means, raised in the estimation of their neighbours, and their influence for usefulness is thus proportionately increased.

Throughout nearly the whole of Germany and Switzerland, all the children, between the ages of 5 and 15, are under the care of teachers educated in this way. There are 46,227 teachers thus trained, working in the primary and superior schools of Prussia alone. I have seen them at work in their schools in various parts of Prussia, Saxony, Baden, Bavaria, and Switzerland. I have lived among them, and associated with them. They are intelligent, well-informed, and able men. They are thoroughly respected by the people.

I did not wonder, when I saw these men, to find that they were constantly entrusted with the younger children of all classes of society, and thus, even in the primary schools of artistic and luxurious Munich, children of mechanics, shop-keepers, professional men, and nobles, were sitting side by side in the same class-room, and under the same teachers. Instead of crowds of children being left to grow up in the streets, filthy, ragged, and neglected, all the children in the towns of these countries are in clean and well-furnished class-rooms, comfortably clothed, and under the care of these educated men. The health, the habits, and the education of these children are carefully watched over and fostered. Healthy sports and exercises are encouraged. Cleanliness is strictly enforced. The necessary clothes are found for those whose parents are not able to provide them.

No candied and unprejudiced man can have watched the effects of these institutions without being convinced that they are improving the physical and moral condition of the people. For my own part, I am sure that even if no instruction whatever were given in these schools, the mere sanitary advantages which are derived from them, in the improvement of the physical condition of the people, would of itself much more than repay all the expenditure which these systems of national education have entailed.

Far more, however, than this is effected by these schools. The children who are educated in this way grow up to be better citizens, more skilful artizans, more efficient soldiers, than the thousands and tens of thousands of poor creatures who are left to grow up in our streets utterly neglected.

If we English would keep our own in the great race of civilisation and of life, it behoves us to think of these things. For I am not only sure that the Prussian army owes its success partly to the intelligence and moral self-control of its soldiers, but I feel convinced that in all those pursuits and manufactures which depend for their success and for their development upon the skill, the intelligence, and the artistic feeling of the workmen, the Germans will pass us in the great race, unless we do much more than we have yet done for the education of the future generation of our workmen.

If no other proof of the admirable effects of these schools existed, there is one proof, which to my mind is incontrovertible, and that is the high value which the workmen and the peasants of these countries set upon the schools, and the respect and affection with which they always speak of the teachers. The poor themselves thoroughly understand the benefits which they and their children are deriving from the schools. The provinces where all these regulations are the most stringently enforced are the democratic cantons of Switzerland, where the people themselves enforce them.

The only discussions which are heard in the parliament are how to perfect all these regulations. No party now dreams of abolishing them. I have myself several times seen poor parents applying to the municipal authorities for permission to send their children before the legal age to school. Many and many a poor parent has told me of the benefits his children were gaining from the schools. I never heard any person in any of these countries speak in a complaining or in a disparaging way of the schools or of the teachers. And yet, spite of the experience of all these countries, it is certain that in this year, 1866, in London alone there are tens of thousands of children, between the ages of five and fifteen, who never receive any training or any education whatsoever.

MINING EDUCATION IN GERMANY.

The hundredth aniversary of the foundation of the well-known Mining College of Freiberg was to have been celebrated last summer, with great festivities. Unluckily, war broke out in Germany, and the celebration of the "Jubiläum" fell to the ground. A work, however, has been published in commemoration of this anniversary*. It contains several interesting articles, most of which are written by professors of the College. The first is a history of the Mining College from its commencement, in 1766. Short biographies are given of the professors and principal persons connected with the College since its foundation. Among these Werner is, of course, the best known, but the names of Gellert, Lampadius, Mohs, von Haidinger, Kersten, Plattner, Naumann, Breithaupt, Weisbach, Scheerer, Reich, and von Cotta, are familiar to the student of metallurgy, mineralogy, mechanics, and geology. In the account of the lectures which follows, it is shown how the plan of instruction was gradually widened until it assumed its present extensive character. The accompanying table shows the proportions the instruction has assumed in the year 1865-66 (see next page).

The students are divided into two classes—those studying at the expense of the State, and those who pay their own expenses. Saxons can have their education free on paying £7 10s. yearly. All other persons pay according to the lectures they attend.

Exhibitions to the amount of £67, besides travelling scholarships to the amount of £75, are awarded every year; they are confined to Saxons studying at the Government expense. There are besides, the Werner, Breithaupt, Bondi, and Fischer exhibitions.

The Mining College costs the State less than £2,000 a year, including the salaries of the professors, apparatus, exhibitions, &c. The library, mineral collections, models, and apparatus, have been valued at nearly £20,000. A useful adjunct to the College is the depôt of minerals for sale. Students are enabled to buy minerals at a comparatively small cost, and as exchanges are made with the regular mineral dealers, specimens from other localities are obtained for the mineral collection.

The second article is by Prof. Dr. Scheerer, Councillor of Mines, on "Mining Studies." After touching slightly upon the practical effects that the mining school has had upon mining generally, he treats at length the influence which the study of mining, as pursued at Freiberg, has upon a man's moral, social, and political character. The picture of politics, from a miner's point of view, is cleverly drawn:—"A high, dome-shaped mountain slopes down on all sides, and is surrounded by precipitous ravines. Its summit, covered with ice and nevé, allows nothing organic to grow up—that is Despotism. The nearer we get to the valley the richer and more luxuriant is the verdant covering of the hillside, until we come to the wild rugged precipice—at the edge of

* "Festschrift zum hundertjährigen Jubiläum der Königlich Sächsischen Bergakademie zu Freiberg.

Lecture.	Number of hours weekly.	Lecturer.
Mathematics, 1st part....	4	Junge.
Descriptive Geometry....	4	,,
General Elementary Mechanics	4	Weisbach, sen.
Mathematics, 2nd part, and higher Mechanics	4	Junge.
Elementary Mining Mechanics	3	Weisbach, sen.
Construction of Mining Machinery, 1st course	2	,, ,,
Construction of Mining Machinery, 2nd course	4	,, ,,
Drawing	14	Heuchler.
Physics	4	Weisbach, jun.
Theoretical Chemistry ..	4	Scheerer.
Practical Chemistry	4	,,
Analytical Chemistry....	4	,,
Mineralogy	4	Breithaupt.
,, Repetition ..	1	,,
Mineralogical Exercises..	2	Weisbach, jun.
Theoretical Crystallography	1	,, ,,
Geology	4	von Cotta.
,, Repetition	1	,,
Palæontology	2	,,
Mineral Deposits.....	2	,,
Architecture	3	Heuchler.
Mining, 1st part	4	Gätzschmann.
,, Repetition.....	1	,,
Mining, 2nd part.....	4	,,
,, Repetition.....	1	,,
General Surveying.....	2	Weisbach, sen.
Practical Surveying	2	Junge.
,, Repetition ...	Daily from morning till evening.	,,
Metallurgy	4	Fritzsche.
Metallurgy of Iron.....	2	Scheerer.
Assaying by the dry way	1	Fritzsche.
Practical Assaying....	Three times a week, five hours at a time.	,,
Assaying by the wet way, and Practical Work	2	,,
Blowpipe Assaying.....	2	Richter.
,, ,, Practical Working	Twice a week two hours.	,,
Mining Law and Business System	4	Gerlach.
Book-keeping	2	Gottschalk.
French Language	4	Prölss.
Private lectures on History of Architecture.....	2	Heuchler.
Technological Chemistry	1	Rube.

this precipice is Republicanism. Between the two extremes there is plenty of sunny and fruitful land, which will afford the Christian settler a peaceful home, without exposing him to the danger of falling over the precipice or being frozen to death. He who has chosen the soil of Constitutional Monarchy as his home has still plenty of scope, either upwards or downwards, only let him take care not to approach too closely to either destructive extreme."

Prof. B. von Cotta contributes an article on "A Collection of Rocks and Fossils in the Courtyard of the Mining College." Perhaps the most interesting and instructive part of the paper for the miner is the short account of the Altenberg Zwitter, a rock containing a sufficient quantity of tin to make it pay for working. Prof. von Cotta proves that there is a gradual passage from fine-grained reddish granite to the almost compact black stanniferous zwitter. The zwitter is an altered granite, which has lost about 3 per cent. of silica and 2 per cent. of potash, and has taken up 4 per cent. of ferrous oxide and ½ per cent. of stannic oxide.

Professor Dr. Scheerer contributes a second paper, entitled "On the Chemical Constitution of Plutonic Rocks." He adopts the division of rocks into *neptunian* (sedimentary), *metamorphic*, *plutonic*, and *volcanic*. In the two latter classes are placed all rocks made up of silicates, which were originally in the melted state, and have since then in part been erupted. Professor Scheerer finds, by comparing a number of analyses, that although these rocks consist of mechanical mixtures of several minerals, they nevertheless have definite chemical compositions, which can be expressed by chemical formulæ. He divides the plutonic and volcanic rocks into nine classes, each class having its own chemical formula. The uniformity of composition of rocks found at great distances from one another is accounted for by supposing that the rock in the melted state was a simple definite chemical compound, and that in the act of hardening its constituents arranged themselves so as to form a mixture of two or more minerals. A number of analyses of plutonic rocks are given, and these are shown to agree very closely with the formulæ which Professor Scheerer lays down.

The groups and classes which Professor Scheerer makes are as follows:—

1st Group.—Plutonic Rocks.

(*Group of the acid and neutral silicates.*)

	Examples.
1. Upper Plutonic	Red gneiss of Saxony.
2. Middle Plutonic.....	Much of the granite of Saxony.
3. Lower Plutonic	Grey gneiss of Freiberg.

2nd Group.—Pluto-volcanic Rocks.

(*Group of the two-thirds silicates.*)

	Examples.
4. Upper Pluto-volcanic	Quartziferous syenite.
5. Middle Pluto-volcanic	Common syenite.
6. Lower Pluto-volcanic	Melaphyre.

3rd Group.—Volcanic Rocks.

(*Group of the one-third silicates.*)

	Examples.
7. Upper Volcanic	Augite porhyry.
8. Middle Volcanic.....	Common basalt.
9. Lower Volcanic	Basic basalt.

The author is of opinion that "If the earth in a liquid state had solidified without any local disturbances, and had been subject to no disturbing influences afterwards, the crust of the earth underneath the sedimentary deposits would consist of these nine chemically typical rocks, all of which would probably have their constituents arranged in a more or less parallel manner."

It is found that a simple determination of the percentage of silica in a plutonic rock is sufficient to settle whether it belongs to the upper, middle, or lower class.

An article "On the Instruction in Practical Surveying at the Mining College," by Professor Dr. August Junge, shows that great pains are taken to make this branch of study complete. Each pupil is expected, during the year that he attends Professor Junge's course, to carry out the following exercises:—

The survey of a mine with the ordinary apparatus.

The survey of a mine with the surveyor's goniometer.

The levelling of a mine, &c.

To connect a mine survey to a surface survey through an adit or inclined shaft, or by the plumb line in a vertical shaft.

A triangulation, including the measurement of the base line.

A survey with the plane table, based upon the previous triangulation, in connection with the compass and theodolite.

To set out a railway or water-courses.

To measure the cubical contents generally of the *attle*-heap of a mine.

To determine the meridian line astronomically, in connection with the determination of time.

Few persons who have studied at Freiberg would pass over the article by Professor Theodor Richter, "On the Blowpipe, and its Application in Chemical and Mineralogical Investigations, and in Assaying," for scarcely a student leaves the town without carrying away with him a real affection, if I may use the term, for the blowpipe, and a grateful recollection of the kind manner in which the instruction was imparted by Professor Richter. The history of the blowpipe given by Professor Richter, from which the following account is abridged, is more complete than that which appears in the last edition of Plattner's "Probirkunst mit dem Löthrohre," or in Dr. Aquila Smith's "Blowpipe Vade Mecum." The earliest notice of the use of the blowpipe in mineralogy is probably that contained in the treatise of Erasmus Bartholin, on Iceland spar, which was published in 1670. He remarks that Iceland spar burns to lime before the blowpipe: "*Quippe, cum frustulum hujus crystalli, flammae lampadis per fistulam, qua vitra hermetice occluduntur, animatae, admoverem; mox animadverti redigi in calcem similem calci vivae, etc.*" "Sweden," says Richter, "must be looked upon as the cradle of blowpipe assaying. We find in that country, from the middle of the last to the first half of the present century, a series of distinguished men who paid much attention to the blowpipe, and considered it an essential instrument in their chemical and mineralogical investigations; I refer especially to von Cronstedt, von Engeström, Bergmann, Gahn, and Berzelius." Von Cronstedt was the first who made a portable blowpipe apparatus, or so-called pocket laboratory. Bergmann extended von Cronstedt's researches, and published in 1779 the result of his experiments in a treatise, "*Commentatio de tubo feruminatorio, &c.*" Gahn made numerous important improvements, but published nothing. Berzelius, however, has given to the world the results of Gahn's experience, with many additions of his own. The appearance, in 1820, of Berzelius' works, "Die Anwendung des Löthrohrs in der Chemie und Mineralogie," forms an era in the history of the blowpipe. The numerous translations of the book enabled foreign chemists and mineralogists to take up the subject. The most important additions to the uses of the blowpipe since the time of Berzelius, have undoubtedly been made by Harkort and Plattner. Harkort, while studying at Freiberg, in 1826, hit upon the idea of employing the blowpipe in quantitative as well as qualitative experiments. He began with the silver assay, and described his process in a pamphlet, published at his own expense, in which he promised that the description of other assays should follow. This promise was never fulfilled, as Harkort took a mining appointment in Mexico, and did not pursue the subject any further. Plattner took up the subject where Harkort left off, and not only completed the silver assay, but also discovered methods of making quantitative assays for gold, copper, lead, bismuth, tin, nickel, and cobalt, by means of the blowpipe. He published his experiments in his "Probirkunst mit dem Löthrohre," which went through three editions during his lifetime, and has been translated into several languages. It should be added that a fourth edition was published in 1865, edited by Professor Theodor Richter, formerly assistant to Plattner, and who has now taken his place as professor of blowpipe assaying.

After a short account of the various forms which the blowpipe has taken in the hands of different experimenters, we come to the mechanical means of producing a blast. The use of the blowpipe was thought by some persons to be injurious to the health, and on this account, and because some persons had a difficulty in keeping up the blast, blowing machines were invented. Berzelius and Plattner set their faces against them, because they did away with the great advantage of the blowpipe—its portability. Of late years an india-rubber blower has been invented, which is light and portable, and may be looked upon as the best substitute for the ordinary blowpipe yet invented. It is especially useful in quantitative assaying, where some effort is required to keep up a steady blast for a long time.

With one part of Professor Richter's article, every Englishman who has studied at Freiberg will fully agree. Professor Richter says: "Looking at the extensive field which has been gradually laid open to the blowpipe, and at the perfection to which it has attained, it must appear strange that even now but a very limited use is made of this instrument in mineralogical researches and in chemical laboratories, although one of the greatest mineralogists* says that in its way it has done as much for the chemistry of minerals as the goniometer for crystallography. The reason of this must be in a certain easy-going carelessness, or in an imperfect knowledge of the experiments which can be performed by the use of the blowpipe, or in the want of that knack which the experiments require, though this need not be anything extraordinary.

"It is true that in books on analytical chemistry mention is usually made of blowpipe experiments, and attention is drawn to their importance in qualitative analysis, but the practical instruction is, alas! often very scanty and insufficient; and when one sees the manner in which the blowpipe is used, as well as the nature of the apparatus employed, one often feels oneself unwillingly carried back to the time of Swab and Cronstedt. When to this is added the fear, which is absolutely groundless, that the blowing is injurious to the health, we need not wonder that most people have a very vague idea of the usefulness of the blowpipe, and consider it unworthy of their special attention.

"And yet these blowpipe experiments are especially fitted, more so than most chemical operations, to create a certain mechanical skill, and to exercise and sharpen the powers of observation. What a small quantity is soon found to be sufficient, both as regards the substance to be tested and the re-agents made use of, and how much quicker in many cases is the end attained!

"The remark is often made, and is frequently also found in books, that blowpipe experiments are confined to a very limited circle. Those who see or will only see in the blowpipe a mere jeweller's instrument, may be right, but he who tears himself away from such one-sided views, and, following Plattner's example, uses the wet way also, will soon be convinced that blowpipe analysis has its special advantages.

"The benefits which quantitative assays by the blowpipe offer to the practical miner or smelter scarcely need any special remark. The miner, above all, who rarely has at hand the extensive apparatus and the instruments of a chemical or metallurgical laboratory, finds in blowpipe assaying the simplest mode of testing the results of his labour.

"The chief obstacle to a more frequent and general application of the blowpipe to the uses indicated in the title of this article, lies, according to my idea, in the fact that a person can rarely get the opportunity of obtaining thorough instruction in the use of this instrument. Berzelius,† in his history of the blowpipe, remarks that such assistance is indispensable, and that without it a person cannot get a true idea of the value of blowpipe experiments. The experience that I have had makes me agree fully with this opinion, and I conclude by wishing and hoping that this difficulty will be gradually removed."

A considerable part of the "Festschrift," is occupied by a list of those who studied at the Mining College, from its opening to the end of the first hundred years.

* Fr. von Kobell, Geschichte der Mineralogie, p. 119.

† Berzelius, Anwendung des Löthrohrs, etc., p. 5.

The list gives the name, place of birth or residence, and the present or last situation. The most distinguished name on the list is that of von Humboldt, who studied at Freiberg in the year 1791. The first Englishman whose name appears is John Hawkins; he matriculated at Freiberg in 1786; he afterwards became a Fellow of the Royal Society, and was a frequent contributor to the "Transactions of the Royal Geological Society of Cornwall." In the following year we find the name of James Watt, of Birmingham.

In the first hundred years there have been altogether 2,465 students at Freiberg, besides certain occasional students who did not matriculate, and whose names do not in all cases appear. Of these 2,465 students, 2,333 were Europeans, the rest from all parts of the world, a large proportion being from South America. Then again of the whole number 2,007 were Germans, and 458 non-Germans, or 1,225 Saxons, and 1,240 non-Saxons.

Baron von Beust, a brother of the late Saxon minister, and who is at the head of all mining in Saxony, and rejoices in the title of "Oberberghauptmann," closes the volume with an article "On the Condition of Mining and Smelting at Freiberg a hundred years ago and at present."

We learn from Baron von Beust's paper that in the year 1765 there were in the Freiberg district 185 mine-buildings, and 3,062 men employed at the mines. The production for that year was 3,671 * tons of ore, as sent to the smelting-house, containing 12,023 lbs. (troy), of silver, 383 tons of lead, and 2 tons of copper, the value of which, according to the present scale of payment for ores, would be about £32,600. Against £1,835 paid in dividends, &c., we have payments of calls to the amount of £3,970. Mining in the year 1765 was not so favourable as it turned out a few years later, when several mines "cut rich," especially Himmelsfürst, Bescheert Glück, and Alte Hoffnung Gottes. The average wages of a miner in 1765 were not more than £8 a-year; but it must be recollected that the miners only worked five eight-hour shifts, or "cores," to use the Cornish expression, in the week. The amount paid by the mines to the *Knappschaftscasse*, or provident fund, was at most only £300 yearly, *i.e.*, $1\frac{1}{4}$ per cent. of the wages, but then the payments to pensioned-off miners, miners' widows and orphans, were very low indeed.

In the year 1865 there were 79 mines at work, with 7,963 miners (including captains and day-labourers). We may add † that in the year 1864 there were only five fatal accidents, although a very large proportion, namely, 3,560 men came into the doctor's hands, either on account of injuries received during their work, or from illness.

The production for the year 1865 was 28,105 tons of ore, containing 69,437 lbs. of silver, 4,344 tons of lead, 73 tons of copper, 179 tons of arsenic. For this the mines received £218,553, besides £755 for sundry products, such as heavy spar, fluor spar, arsenical pyrites, &c. The amount paid in dividends, &c., was £13,267, whilst the calls only amounted to £6,367; the state also paid £1,903 for extraordinary improvements in the Government mine, Churprinz.

The average wages for the year, per man, were £16 10s. It must be recollected, in comparing this with earlier times, that a hundred years ago the miner only worked about 40 hours a week, whereas now he works 66. If a miner, a hundred years ago, had worked 66 hours a week instead of 40, his wages would have amounted to £13 4s.; comparing this with £16 10s., we see that wages have risen 25 per cent.

With respect to the funds of the Provident Society, we find that the owners of mines paid 15 times as much as they did a hundred years ago, although there are only $2\frac{2}{3}$ times as many men, and although the total value of the produce has only increased $6\frac{2}{3}$ fold. The miners also contributed more largely, and, consequently, the pensions can be made from $2\frac{1}{2}$ to 3 times as much as they were in 1765.

Baron von Beust considers that the price of materials and carriage has risen, on the whole, 30 to 40 per cent. during the last hundred years. For though some things, for instance powder, are cheaper, yet wood, which is so largely used, has become much dearer. However, the mines are better paid for their ore than formerly, and are better off with regard to the payment of taxes; still, in the opinion of von Beust, this does not make up for the increased expenditure in materials and carriage. Since 1765 the principal mines have been deepened to the extent of 100 to 150 fathoms, and more than 100 miles (English) of levels have been driven.

No exact record exists of the amount of machinery employed in 1765, but in 1757 there were only 18 water-wheels working pumps, and 5 working whims. Von Beust puts the total horse-power of the water-wheels for pumping at 180, and of those for winding at 30.

In 1865 there were at the Freiberg mines:—

	Total horse-power.
29 water-wheels for pumping	429
6 turbines „ „	190
14 water-column engines „	416·5
8 steam-engines „ „	281
16 water-wheels for winding	155
2 turbines „ „	16
18 steam-engines „ „	343

This makes a total of 1,316·5 horse-power employed in pumping, and 514 in winding. The amount of machinery used in dressing has also risen very considerably.

In order to lessen the expense of keeping the levels in good order they are walled as much as possible with bricks—to a greater extent, perhaps, than will be met with in any other mines.

Von Beust makes a curious calculation with regard to the Freiberg lodes. He says that in 1765 the value of a square fathom, taken along the lode, may be estimated at £10 7s., whilst in 1865 it was only £6 9s.; putting the average value for the last hundred years of a square fathom taken along the lode at £10 6s.—and for this von Beust gives his reasons—we see that the value of the stuff worked during the year 1865 is very considerably below the average. The reason of this lies only to a small extent in the fact that they can now work ores which formerly were too poor to pay; the chief reason, according to von Beust is, that during the last few years the lodes have become poorer.

We next come to the smelting works, and, beginning with the ores, it is stated that the mines are now paid 12 per cent. higher for the lead and silver contained in the ores than they were a hundred years ago. In those days charcoal and wood formed the chief fuel, now it is coal and coke. The wages in 1765 were very low; a smelter only got from 3s. to 4s. $2\frac{1}{2}$d. a week, whilst now he gets from 8s. 5d. to 10s. 6d. The loss of metal was large, being 4 per cent. of the silver, and 81·5 per cent. of the lead. This enormous loss of lead was caused by the proportion of lead to the silver in the ores smelted being too small, and the lead was worked over and over again. The loss is now 1 per cent. of the silver and 15 per cent. of the lead. The net profit to the Government in the year 1765 was £5,000, now there is a profit of £60,000.

The most important technical improvement in smelting during the last hundred years, was the introduction of the European amalgamation process; some ten years ago it was replaced by other processes. During the last ten years great efforts have been made to neutralise the bad effects of the sulphurous and arsenical smoke given off in treating some of the ores. Although this has been done at considerable expense, it has opened out a new field of usefulness, the profits of which, it is hoped, will compensate for the expense incurred. Among other

* All the weights and measures used in this article have been reduced to English standards.

† Jahrbuch für den Berg-und Hüttenmann, 1866, pp. 60 and 61.

things the following improvements have been introduced:—Rhenish calciners, with a double bed; blast furnaces, with closed breast and water tuyeres; English reverberatory furnaces, lead refineries, and Pattinson's process; flues and chambers for catching the fume.

Among the peculiarities of the Freiberg smelting works we have the extraction of copper from argentiferous copper regulus, by means of sulphuric acid, and the production of blue vitriol, and then again the utilization of the smoke from wasting pyritiferous ores in the manufacture of sulphuric acid.

The production of zinc on a large scale has not yet succeeded, but it is hoped that it will soon become a profitable branch of manufacture.

In the year there were bought 39,108 tons of ore and "sweeps" from home and abroad, containing:—135 lbs. of gold; 80,289 lbs. of silver; 4,446 tons of lead; 139 tons of copper; 1¼ ton of nickel and cobalt; 179 tons of arsenic; costing £26,178.

In the year 1865 the smelting works sold 97 lbs. of gold, 84,149 lbs. of silver, 3,608 tons of lead (in part as shot, sheet-lead, pipe, &c.), 856 tons blue vitrol, 18 tons nickel speiss, 12 cwt. bismuth, 12 tons zinc, 2,095 tons sulphuric acid of 66°, 37 tons green vitrol, 93 tons sulphate of soda, and 500 tons arsenical products. The total amount received for the whole was £392,653.

Fine Arts.

THE LOUVRE.—Another fine new room has been opened in the Louvre; a large square apartment, situated in the Pavillon Denon of the new Louvre, and between the two galleries, appropriated to the French school, opened some time since. It is highly decorated; in the centre of the ceiling is a seated female figure, writing on large tablets, painted in what is called *camaïeu mordoré*, reddish brown tints, by M. Charles Müller. In the angles are four historical pictures, the subjects of which are:—Louis XIV. ordering the construction of the Louvre; François I. in the atelier of an artist, with a sketch of the famous Chateau de Chambord in the distance; St. Louis, with a view of that architectual gem the St. Chapelle, which was built by his order by the side of the Palais de Justice, where he resided, to receive the relics brought from the Holy Land; and, lastly, Napoleon I. decreeing the completion of the Louvre, which his nephew, the present Emperor, accomplished. Around the ceiling are richly-decorated vaultings. The room is surrounded by an entablature, forming a balcony, and above this are eight female figures, representing the fine arts in their various forms, and painted in false niches. On the walls are the battles of Alexander, by Charles Lebrun. The ancient apartments of Anne of Austria, which contain a portion of the classic sculpture of the museum, have been thoroughly decorated, and will shortly be opened again to the public.

Manufactures.

THE RESULTS OF THE RECENT STRIKES IN THE IRON TRADE.—It is calculated (says the *Colliery Guardian*) that about £300,000 has been lost to the men in wages alone, while the contributions which the union has given to some 3,000 of the 10,000 to 12,000 who have been thrown out by the strike, have not exceeded £10,000, leaving a net loss of £29,000; while by far the greater portion of the men have had no assistance whatever, and have been compelled to endure the greatest privation and suffering. But, in addition to this, by suspension of work for the nineteen weeks of the strike, a sum of about £1,250,000 has been lost to the district, and must have made a great difference to tradesmen of all kinds. There are also secondary losses which will have to be borne. The malleable iron trade has been directed into other channels, and under the most favourable circumstances a long time must elapse before it will be got back again. This means short time even at the reduced wages, and the non-remunerative employment of capital for the manufacturers, with corresponding effects to all who depend directly or indirectly upon the iron trade. The labour market has also been affected in two ways. A large number of fairly-skilled underhands have risen to a foremost place, and the men imported from other districts are far more numerous than are those who have left the north country.

SUGAR MANUFACTURE IN THE WEST INDIES.—The system of sugar extraction pursued in most tropical countries (says the *Produce Markets Review*) is well known to be defective to the last degree, and, in fact, the operation, far from being so easy as to be completely performed by the rough-and-ready way, is a most difficult science, and requires the combined aid of skilled agriculturists, chemists and machinists, to be properly carried out. The waste caused by the present system is something astounding, and has been briefly summed up by chemical authority on the basis of an average yield from the West Indian canes of 18 per cent., thus:—

One-third is left in the megass.....	6	per cent.
One-fifth of the remainder in the skimming	2½	„
One-third to one-half of the second remainder in the molasses	3	„
Leaving for actual sugar exported	6½	„
Total	18	„

It will be remembered that the object of the process is to make sugar; and its result, so far as the West Indies is concerned, is that out of 900,000 tons contained in the canes, 325,000 tons only are exported in the shape of sugar. The value of the sugar in the canes at 25s. per cwt., is £22,500,000. The value of the 325,000 tons of sugar extracted at the same price is £8,125,000; the value of the 150,000 tons of molasses is £1,200,000; of the rum extracted from the skimmings (according to the value of the imports into England), £600,000; or, in short, the planter extracts from his canes £9,925,000 worth of produce, instead of the £22,500,000 he might get. But this is not all his loss, for the produce is so imperfectly prepared that 10 per cent. of the sugar, or 32,500 tons, worth £812,000, drains away on the voyage, and is lost to the West Indian producer—who thus in reality receives in round numbers £9,100,000 instead of the £22,500,000 he might earn. In fact, he loses 60 per cent. of his possible gains. This waste is so great as to be almost inconceivable, and a year ago, when these statements were brought before the West Indian planters, they were dismissed as highly exaggerated amounts by those gentlemen. However, the rapid spread of beet cultivation on the Continent has caused cane planters to look more closely into their system of late, and a great change has taken place in their tone; now that the system is admitted to be imperfect, we may look for rapid improvement, for although Englishmen are hard to convince that anything is wrong, when convinced no nation is so quick in setting abuses right. That it is high time to be up and doing is evident. The Continental beet crop in a few years will probably reach 1,000,000 tons. The beetroot in the best German factories (that, for instance, of Herr Robert, at Seelowitz, in Prussian Silesia), is made to yield 11 per cent. of its weight in actual raw sugar; and advertisements are inserted in the *Journal des Fabricants de Sucre* on the part of Baron Koppy, of Kraïn, Silesia, offering to supply beetroot containing 15 per cent. of saccharine matter. These results have been obtained by careful selection, year after year, of the richest plants, by the most careful agriculture, and by apylying all the resources of chemical ard mechanical science to the extraction of sugar; and the advance in the industry may be gathered from the fact that it is not

more than half-a-century old; that the original beet only contained 4 per cent. of sugar; that the per-centage has now increased to 15; and that the quantity of sugar obtained from given quantities of root has been doubled within the last ten years. The cause of this difference between sugar manufacturers in Europe and in the West Indian Colonies is not hard to find, and is simply owing to the coddling system pursued; first, by giving the colonial sugars an ostensible protective duty after emancipation; and then by renewing the protection in a concealed form under the system of graduated sugar duties. But such weak barriers cannot control the great laws of supply and demand. Now that the West Indians find that they have been resting on an unnatural protection, which has become worse than useless to them, let them cast their artificial aids aside, by advocating the removal of the scale of sugar duties. Let them at the same time select the richest saccharíferous plants, study agriculture, practical chemistry, and mechanics, and they will secure a rapid renewal of their prosperity.

Commerce.

Consumption of Sugar.—The consumption of sugar, which is known from official returns to be on the increase in England, owes this enlargement to two distinct sources—to the gradually increasing prosperity of the country, and latterly, to the employment of sugar as a substitute for other ingredients, as for instance, in place of malt, for brewing purposes. To form a fair estimate of the sugar consumption of the whole world is impossible (says the *Produce Markets Review*), owing to the absence of returns of the consumption in the tropical producing countries. For the continents of North America, Australia, and Europe, the returns can be had, and are certainly of an interesting character. The total consumption of sugar for Europe in the past year amounts to 1,600,000 tons, of which 900,000 tons were cane, and 700,000 tons beet sugar; the consumption of the United States is 400,000 tons; the Board of Trade returns give the total for the Cape of Good Hope, Natal, Canada, Prince Edward's Island, Newfoundland, Queensland, New Zealand, New South Wales, South Australia, Victoria, together with the imports of foreign sugar into India, as 100,000 tons. If to these be added 30,000 tons for the maple crop, then is obtained a sum total of 2,130,000 tons to represent the consumption of the civilised world. To this large amount has of course to be added the vast quantity of sugar of home growth consumed in India and the other tropical producing countries in Asia, Polynesia, America, and Africa; but in the absence of all data, any estimate of the total consumption of the world must be a mere guess. The following figures will conclusively show the extraordinary fall that has taken place in the value of sugar during the last eight years. Excluding all considerations of the reduction in the sugar duty which took place in the year 1864, the bonded price of raw sugar in England is now 4s. per cwt. lower than at the corresponding period in 1865; 1s. 6d. lower than in 1864; 6s. 6d. lower than in 1863; 2s. 6d. lower than in 1862; 2s. lower than in 1861; 6s. 6d. lower than in 1860; and 5s. 6d. lower than in 1859. The lowest price of lump sugar, also calculated in bond, is now 2s. less than in 1865; 2s. 6d. less than in 1864; 7s. less than in 1863; 1s. dearer than in 1862; 5s. 6d. cheaper than in 1861; 4s. less than in 1860; and 4s. 6d. less than in 1859. To the consumer at the duty-paid price, the reduction is of course still more marked; and, taken in this way, the English price of raw sugar is 4s. lower than in 1865; 1s. 6d. lower than in 1864; 10s. lower than in 1863; 6s. lower than in 1862; 5s. lower than in 1861; 10s. lower than in 1860; and 9s. lower than in 1859. The consumer of loaf sugar can now buy it at 2s., 2s. 6d., 12s. 6d., 4s. 6d., 9s., and 9s. 6d. cheaper than in the Decembers of the years 1865 to 1859 respectively. The stock of raw sugar in the four principal British ports at the end of the year was 163,086 tons, against 175,167 tons last year; the landings for the fifty-one weeks have been 493,661 tons, against 479,761 tons; the duty-paid deliveries 495,884 tons, against 481,558 tons; and the exports 14,245 tons, against 21,086 tons. These figures show for the four ports a smaller stock of 12,081 tons, an increase in the landings for the fifty-one weeks of 13,900 tons, an increase in the home consumption of 14,326 tons, and a decrease in the exports of 6,841 tons, as compared with the corresponding period of last year.

Cotton in the French Colonies.—Although the herbaceous cotton plant sometimes grows to a height of from ten to twelve feet, it is not when cultivated allowed to exceed four or five feet in height, as in that case its products diminish both in quantity and quality. In Senegal the cotton plant suffers either from excess of humidity or from drought. The French colonies most suitable for the production of cotton are the Isle of Réunion, Tahiti, and Guadaloupe. At Réunion the Indian cotton plant acquires a quality so far superior, that it is with difficulty that the primitive type can be recognised. Cochin China also furnishes a quality of a medium fineness, the demand for which is very important. The cultivation of this plant no doubt exhausts the soil, which requires to be well manured every year. The beautiful sea island cottons are grown in soils moist from the salt sea air, and susceptible of being irrigated during dry seasons; but in order that they should succeed perfectly, it is necessary that they should be sheltered from heavy winds. It generally seems to prefer the vicinity of the sea in dry countries, and the interior districts of naturally damp climates; these facts lead to the inference that it is not merely temperature by which the quality of cotton is affected, but a peculiar combination of heat, light, and moisture. The land for the cultivation of the cotton plant requires frequent labour. The inhabitants of the Southern States of America perfectly understand this cultivation; their example should be taken, and there is no doubt that even with free labour similar results will be obtained in the French colonies.

Sericulture in Austria.—The cultivation of the mulberry and silk industry tends to increase in importance every year in Austria. The produce of cocoons for 1864 is estimated at about 133,347 quintals, about 13,134 tons, including the produce of the Venetian provinces. The rearing of silkworms is more important in the southern provinces of the empire, that is to say, in Istria, Carinthia, Croatia; and that industry has also made great progress of late in Hungary and Bohemia, and is carried on on a large scale in Upper and Lower Austria, and to the south of the Tyrol. A much greater development would have been made in the last twelve years if the disease had not made considerable ravages in all the provinces, where it has even in many places completely put an end to the rearing of silkworms. The disease first made its appearance in Austria in 1847, five years later than in France. The country that has most suffered from it is Hungary.

Colonies.

Iron in Tasmania.—It has long known that iron in almost a pure metallic state exists in different parts of the island, and that iron ores are abundant, particularly in the north. So far back as 1823, Mr. Commissioner Bigge reported to the House of Commons on the iron ore of Ilfracombe, in the West Tamar District. But Mr. Gould, the government geologist, has lately been exploring that region more fully, and made a report to the colonial parliament last session on the subject. He says:—There are four varieties; the principal are earthen brown hematite, crystallised brown hematite

and magnetic oxide; the other, which is earthy red hematite, is of more sparing occurrence, and is evidently a mere derivative from the previous ores. Unlike other iron ores which I have observed in many parts of the colony, and which consist merely of hematites formed by the deposition of ferruginous matter from rocks containing a small per centage of iron as an element of composition, these appear to be contained in real mineral lodes, or to be derived from the contents of such, and their formation appears to have been determined by a mineral force acting in defined directions. The ore is of greatest excellence in the lower ground, that at the extreme upper end being inferior in richness and not quite so abundant in quantity. The ore shows itself to be of good quality, however, for more than one-half of the length of the reef, and even the remainder is at least equal to much of the iron ores smelted in other countries. The average width is about 66 ft., the length outcropping 300 yards, and the average slope about 14°. Taking a rough estimate, this gives the cubic contents of the portion of the vein above the water-level at about 705,800 tons. Assuming that only one-half of this is rich ore, we have an amount of 350,000 tons of rich ore lying above the water level, and presenting every facility for being quarried at an exceedingly low rate per ton, the other moiety presenting equal facilities of working; while every yard in depth below the level would yield, on the same calculation, 20,458 tons.

WATER IN NEW SOUTH WALES.—On the Darling Downs supplies of water have been obtained from cones, formed of a crust or deposit, from three or four to twenty feet high. This crust is composed of an admixture of hardened clay with small quartz pebbles, much worn by the action of water. When the crust is broken water spurts out in a small and continuous stream. The water is very clear, cool, and fresh. At one of those natural reservoirs about 10,600 sheep are watered daily, and yet the supply from the cone does not seem to be at all affected. These strange aqueducts may turn out to be as valuable to the grazier as they are interesting to the geologist. The pastoral occupants of Crown lands in the Lachlan districts are taken steps towards securing for themselves permanent water supplies.

NEW SOUTH WALES FINANCE.—According to the financial statement of the treasurer, the public debt of the colony of New South Wales is at the present time £5,634,930, consisting of debentures for £5,240,030, bearing interest at 5 per cent., and treasury bills to the amount of £349,900, bearing interest at 6 per cent. The estimated revenue for 1867 is £2,253,500, and the charges upon it £2,013,992, leaving a balance on the year of £239,513. The revenue received up to the 31st August was £1,240,800, and the estimated amount for the remainder of last year was £786,358, making a total of £2,032,579.

Publications Issued.

TRAITE DES MATIERES COLORANTES, &c. By P. Schützenberger. 2 vols., 8vo. (*Paris: Masson and Fils.*) An important work on a very important trade—that of dyeing; a treatise on colouring matters, with their applications to dyeing and textile printing; and notices on textile fibres, dressings, and mordants, published under the auspices of the *Société Industrielle* of Mulhouse, and with the aid of the Chemical Committee of the Society, by M. P. Schützenberger, formerly professor of chemistry in the superior school of Mulhouse. The quotation of the above from the title page will recommend this work to all who are interested in the application of colouring matters to industrial purposes. The volumes are illustrated, not only by cuts, but also by specimens inserted in the text. It appears that there was previously no special work on the history of colouring matters in France, and the greater part of the technological treatises which touch the subject were published previous to the discovery of many of the most beautiful artificial colours now in use. M. Schützenberger, whose work now supplies the void referred to, conducted for more than ten years the laboratory for practical instruction in the school of Mulhouse, and should therefore be thoroughly *au courant* with recent discoveries, while the co-operation of the Mulhouse Industrial Society greatly strengthens his position in a practical point of view. Besides describing the various dyes and other matters employed in dyeing and printing, their modes of preparation and employment, M. Schützenberger gives the means of ascertaining their relative purity, and the methods in use for fixing the colours in dyed fabrics. The manufacture of muslins, in which madder colours play so important a part, occupies a considerable portion of the work, and the actual samples of muslin and silk, produced expressly for the work, amount to more than 70 in number. The book comes before the world with a recommendation, by M. Dumas, of the French Institute.

Notes.

ECONOMICAL WAY OF PRESERVING FRUIT OR POTATOES.—Apples, pears, or potatoes may be easily preserved in the following manner:—A dry and well-ventilated place should be chosen, if possible on the ground-floor; on this a layer, about four inches thick, of rye straw is spread, then a layer of fruit or potatoes of the same thickness, and this is sprinkled with powdered plaster of Paris; on this another layer of straw, then fruit sprinkled with plaster, and so on, till five or six successive layers of straw, fruit, and plaster have been formed. In this manner, potatoes may be kept fresh for some time, and the growth of the long white shoots, so detrimental to their nourishing qualities, and which render them unfit for planting, is prevented.

NEW GAS.—The town of Coburg, Canada West, has been lighted with a new gas, made from pine wood, bones, and refuse vegetable and animal matter. The light, it is said, is quite brilliant, surpassing that manufactured from coal, which had been formerly used, while it will be more economical.

DEPOSIT BANK FOR SEAMEN.—The Board of Trade have established at Liverpool an experimental deposit bank, which, it is believed, will be found highly advantageous. No interest is allowed, but a seaman can at once deposit any amount, and withdraw it at a moment's notice, so that there is now no excuse for his trusting it to the care of people whose only object is to plunder him. When a seaman is going upon a voyage he can have his money transferred from the deposit bank to the savings bank, and then interest is allowed at the rate of three per cent. per annum.

LIVERPOOL GALLERY OF INVENTIONS AND SCIENCE.—The committee of this institution invite the attention of inventors, manufacturers, and dealers, to the advantages which this institution affords them of exhibiting gratuitously in this great commercial centre, models of new inventions, and objects illustrative of progress in the arts and sciences. No charge is made to exhibitors, the object of the founder (the late late Sir William Brown, Bart.), and of the committee of management being to render the gallery commercially beneficial to exhibitors, as well as a means of affording interest and instruction to the general public. Forms of application for space, and further information, may be had of the honorary secretary, Mr. Astrup Cariss, 3, Cook-street, Liverpool.

Correspondence.

STORM SIGNALS.—SIR,—I desire to endorse the opinion of your correspondent, Mr. Wilson (see *Journal*, 28th Dec.), representing the system of the late Admiral Fitz-

roy for the foretelling of storms, and to express my regret that it has been discontinued entirely, even for a time. It is well known that the Admiral sacrificed a large amount of time and of money in endeavouring to improve the system, and there can be no doubt that, to some extent, he was successful in his predictions, or forecasts, as he termed them. It is my intention to search the records, at some convenient time, for the purpose of ascertaining whether my idea be correct, namely, that in two cases out of three his forecasts were verified by the event, according to his statement in 1862, that "by continued and consecutive series of charts, several hundred in number,—constructed on the synchronous principle,—an insight into the laws of our atmosphere has been gained which has enabled us to know what weather will prevail during the next two or three days, and, as a corollary, when a storm will occur." I hope that, at least partially, the system may be continued as suggested by your correspondent.—I am, &c., CHR. COOKE.

31st December, 1866.

MEETINGS FOR THE ENSUING WEEK.

MON.....R. Geographical, 8½. 1. "A Journey to Kano from the Inger;" by the late Dr. W. B. Baikie. 2. The Bishop of Mauritius, "On the North-east Province of Madagascar." 3. Lieut. T. H. Lewin, "Diary of a Hill Trip in Burmah."
British Architects, 8.
Medical, 8.

TUES ...Civil Engineers, 8. Mr. John Bourne, "Ships of War."
Statistical, 8. Dr. Mouat, "On Prison Statistics of India."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Rev. Chas. Kingsley, "On the Ancien Régime as it existed on the Continent before the French Revolution."

WED ...Meteorological, 8.
Society of Arts, 8. Capt. Toynbee, "On Mercantile Marine Legislation, as affecting the Number and Efficiency of British Seamen."
London Inst., 6½.

THUR ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. 1. Dr. Cobbold, "On *Distoma clavatum* from the Sword-fish." 2. Dr. Cobbold, "Experiments with *Trichina spiralis*."
Zoological, 4.
Numismatic, 7.
R. Society Club, 6.
Chemical, 8. 1. Mr. Thos. E. Thorpe, "On the amount of Carbonic Acid in Sea Air." 2. Prof. Frankland and Mr. Duppa, "Synthetical Researches on Ethers." 3. Prof. Wanklyn, "Laboratory Contributions."
Royal Inst., 3. Rev. Chas. Kingsley, "On the Ancien Régime as it existed on the Continent before the French Revolution."

FRI .....Royal Inst., 8. Prof. Tyndall, "On Sounding and Sensitive Flames."

SAT .....R. Botanic, 3½.
Royal Inst., 3. Rev. Chas. Kingsley, "On the Ancien Régime as it existed on the Continent before the French Revolution."

Patents.

From Commissioners of Patents' Journal, January 4th.

GRANTS OF PROVISIONAL PROTECTION.

Armour plating—3249—W. C. Nangle.
Automatic figures—3278—J. H. Pepper and S. F. Pichler.
Billiards, &c., marking boards for—3294—W. H. Burroughes.
Breech-loading fire-arms, and cartridges and bullets for—3253—W. E. Newton.
Breech-loading fire-arms, and cartridges for—3252—E. J. Warmington.
Breech-loading fire-arms, cartridges for—3183—T. Wilson.
Buckles—3239—H. Southall.
Cast-iron sash windows—3199—V. Vandroy.
Clasps—2892—J. C. Newey.
Combs and hackles, drilling—3087—T. R. and T. W. Harding.
Electro-magnetic and magneto-electric machines—3209—H. Wilde.
Fabrics, pressing the surfaces of—3211—L. Cobe.
Fibres, assorting—3260—J. Varley.
Fibrous substances, combing—3251—W. Hopkinson.
Fibrous substances, combing—3263—J. Studley and E. Jackson.
Fibrous substances, doubling—3250—J. Tolson.
Fire-arms and cartridges—3243—W. Richards.
Fire-arms, breech-loading—3244—H. Dines.
Fluids, heating and cooling—3179—J. A. Coffey.
Furnaces—3197—T. Bridges and J. Bigwood.
Gas—3258—E. S. Cathels.
Glass, ornamenting—3270—J. Robinson.
Grain, cleansing—3083—R. Potter.
Graining, tools for—3235—T. Chaloner and J. Billington.
Green colouring matter—3152—W. Clark.
Hammock cot—3290—A. Woods.
Iron and steel—3280—J. Stenson.
Iron and steel, coating—3047—C. E. Brooman.
Iron—3189—W. H. Richardson.
Lace—3213—W. Selby.
Metallic tubes—3181—J. Horton.
Motive power—3173—W. Clark.
Parallel rulers—3241—J. Davies.
Penholders—3215—J. Darling.
Photographic pressure frames—3221—F. Lane.
Photography, obtaining designs by—3177—D. Winstanley.
Pianofortes—3288—H. Brinsmead.
Pianofortes and harmoniums—3172—E. McLean.
Planting machines—3223—J. Freer.
Plastic materials, articles from 3292—T. V. Morgan and E. Hyles.
Ploughs—3175—F. Volkmann.
Printing—3227—J. and P. Lowe.
Pulleys—3286—T. Andrew.
Pumps—3242—W. Warren.
Railway buffers—3261—T. H. Cooper.
Railway carriages—3256—C. E. Brooman.
Railways, preventing accidents on—3191—W. E. Hickling.
Ropes—3225—W. Guest.
Rotary engines—3207—W. Clark.
Safes—3265—S. Chatwood.
Saw frames, applying motive-power to—3267—J. Robinson and J. Smith.
Scrubbing machines—3282—W. R. Lake.
Sewing and embroidering machines—3284—L. Lindley and F. Taylor.
Sewing machinery—3246—F. Armstrong.
Sewing machines—3185—E. Sang.
Sheep shears—3255—W. Hopkinson.
Ships' capstans—3240—W. H. Biggleston.
Slates, dressing—3268—H. Wren and J. Hopkinson.
Specific gravities, separating substances of different—3205—T. J. Chubb.
Spelter—3117—C. Crockford.
Steam boilers—3027—S. Glenton.
Steam boiler tubes, cleaning—3259—W. E. Newton.
Steel—3203—T. J. Chubb.
Steel 3266—V. Gallet.
Stone dressing—2705—E. W. Uren.
Stoves—3274—C. Sinibaldi.
Studs or nails—3248—C. E. Brooman.
Sugar cane, cutting—3187—F. Kohn.
Tool holders and cutters—3247—W. F. Smith and A. Coventry.
Vessels, propelling—3219—G. H. Phipps.
Water, measuring the supply of—3296—T. Hoey.
Weaving, looms and shuttles for—3217—G. Haseltine.
Weaving, looms for—3254—R. Clayton, J. Raper, J. Goulding, and W. Howarth.
Weaving, looms for—3257—C. E. Brooman.
Weft forks—3184—J. Broadbent.
Window sashes and frames—3264—T. Jones.
Yarns—3231—R. Smith and J. Ramage.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Nautical logs—3430—A. B. Ely.
Steam engines—3452—G. T. Bousfield.
Street sweeper—3417—W. Smith.

From Commissioners of Patents' Journal, January 8th.

PATENTS SEALED.

1781. R. Fowler.
1782. H. G. Fairburn.
1784. J. D. Brunton.
1788. E. H. Aydon and E. Field.
4789. J. A. Salmon.
1790. C. Heptonstall.
1797. J. Murray.
1799. T. Ivers and J. Haddock.
1801. W. Moseley.
1802. J. Elder.
1810. W. J. Curtis.
1813. G. W. Hawksley, M. Wild, and J. Astbury.
1820. C. E. Austin.
1826. J. Moseley.
1828. K. H. Cornish.
1845. P. Ellis.
1853. R. Clough and P. Smith.
1875. J. J. L. M. Lagarrigue and P. A. Castera.
1888. M. A. F. Mennons.
1901. R. Newton.
1921. W. E. Newton.
2039. H. Holland.
2040. G. Davies.
2204. H. A. Dufrené.
2484. F. Haseltine.
2554. G. E. Searle.
2674. A. V. Newton.
2778. E. Howard.
2924. W. E. Newton.
2926. H. A. Bonneville.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

3. J. W. Nottingham, W. H. P. Gore, & A. H. A. Durant.
34. G. T. Bousfield.
90. C. Bartholomew.
18. W. Hall.
28. J. B. Fenby.
37. E. Fairburn.
368. T. White.
48. J. Ramsbottom.
57. P. Walters.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

3000. J. Eason.
31. A. Chambers.